Trigger with PID counter

2008/12/12 K.Inami (Nagoya-U)

Barrel detector

- Quartz bar: ~255cm^L x 40~50cm^W
  - 16~18 ϕ-segment
- Photon detector array
  - On the bar ends.

Focus mirror
(sphere, r=5000)

z=1830   z=1070   R=1180   z=-780

Forward   Backward

47.8°

32.8°~123.5°

IP
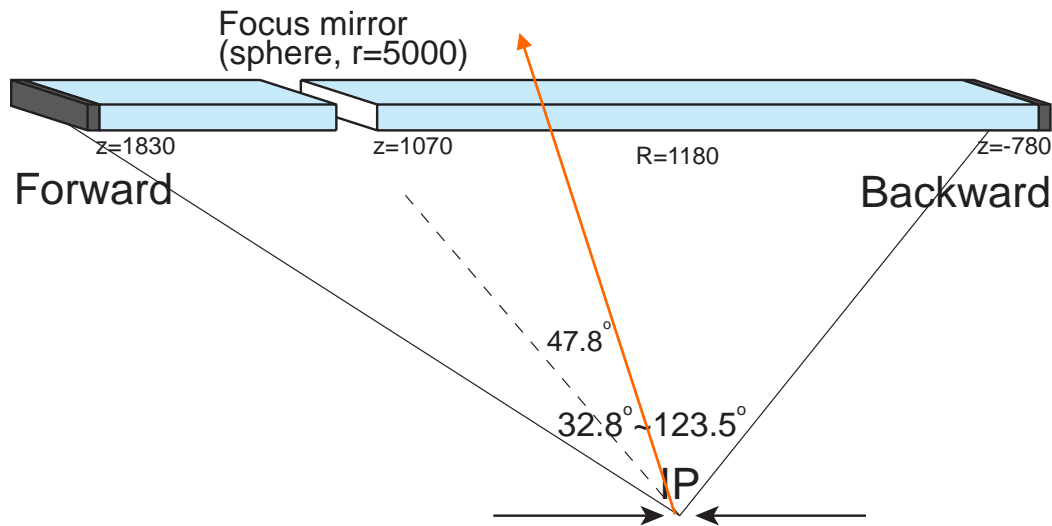
- Trigger pattern
  - Similar to current TOF
  - Output timing depends on position.

Drawing by
Marc Rosen(UH)
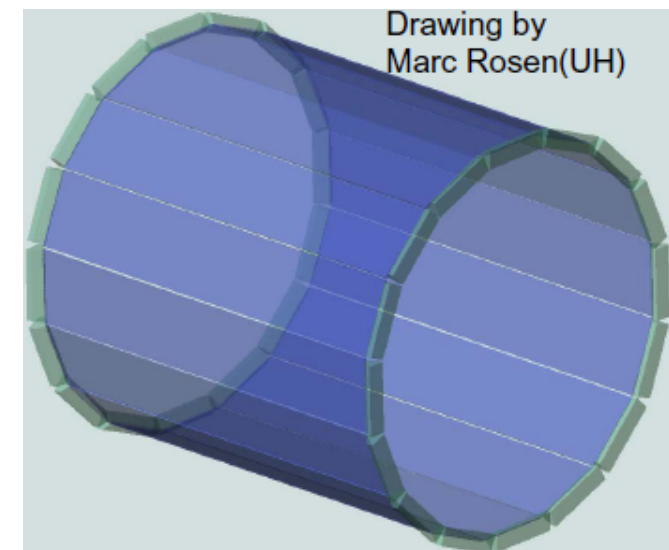
Photo-detector response

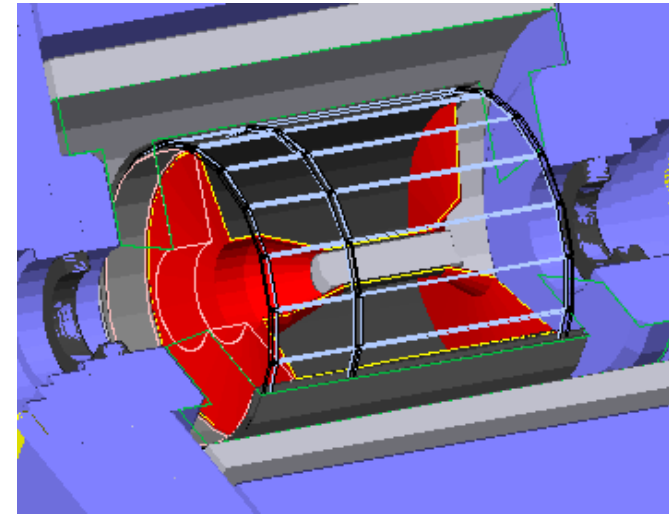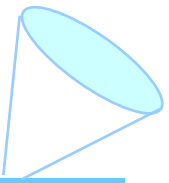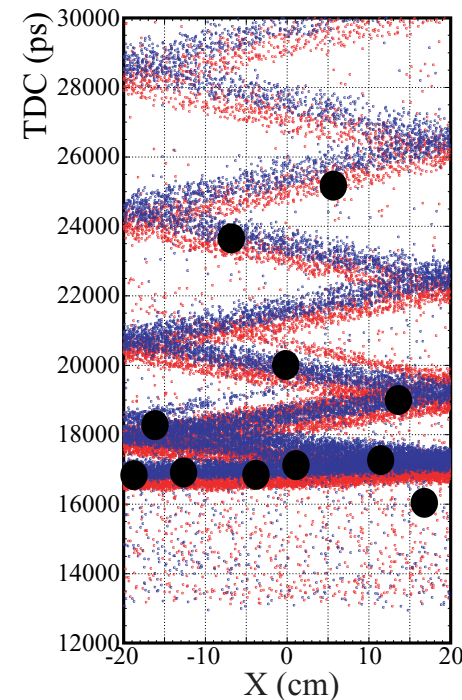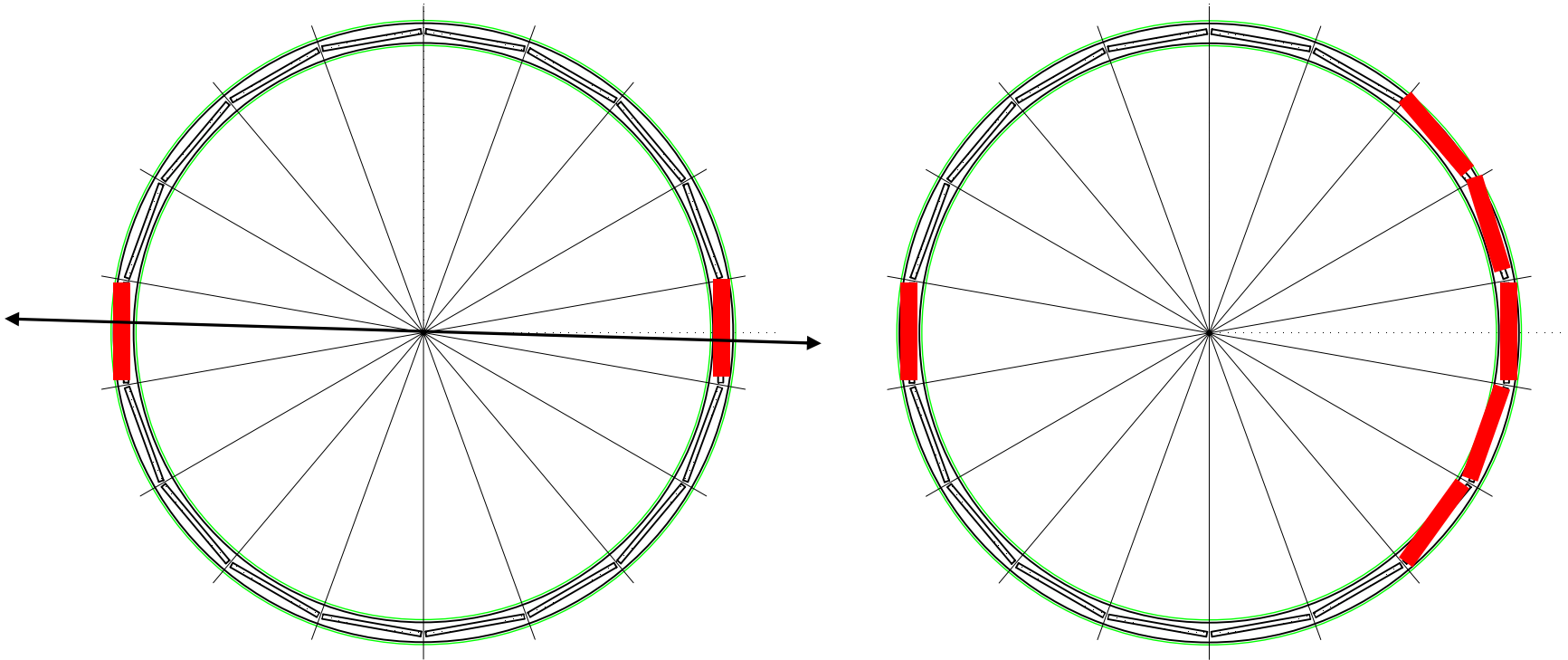- Detect ~10 photons per segment per track
- There are ~10 PD hits within ~10ns.
  - Need to avoid noise hits due to dark current, beam BG.

- Possible trigger-hit logic;
  - >a few PD hits within some time window
  - Trigger-hit is issued with the timing
  - Parameter
    - Threshold of N_{hits}, width of time window
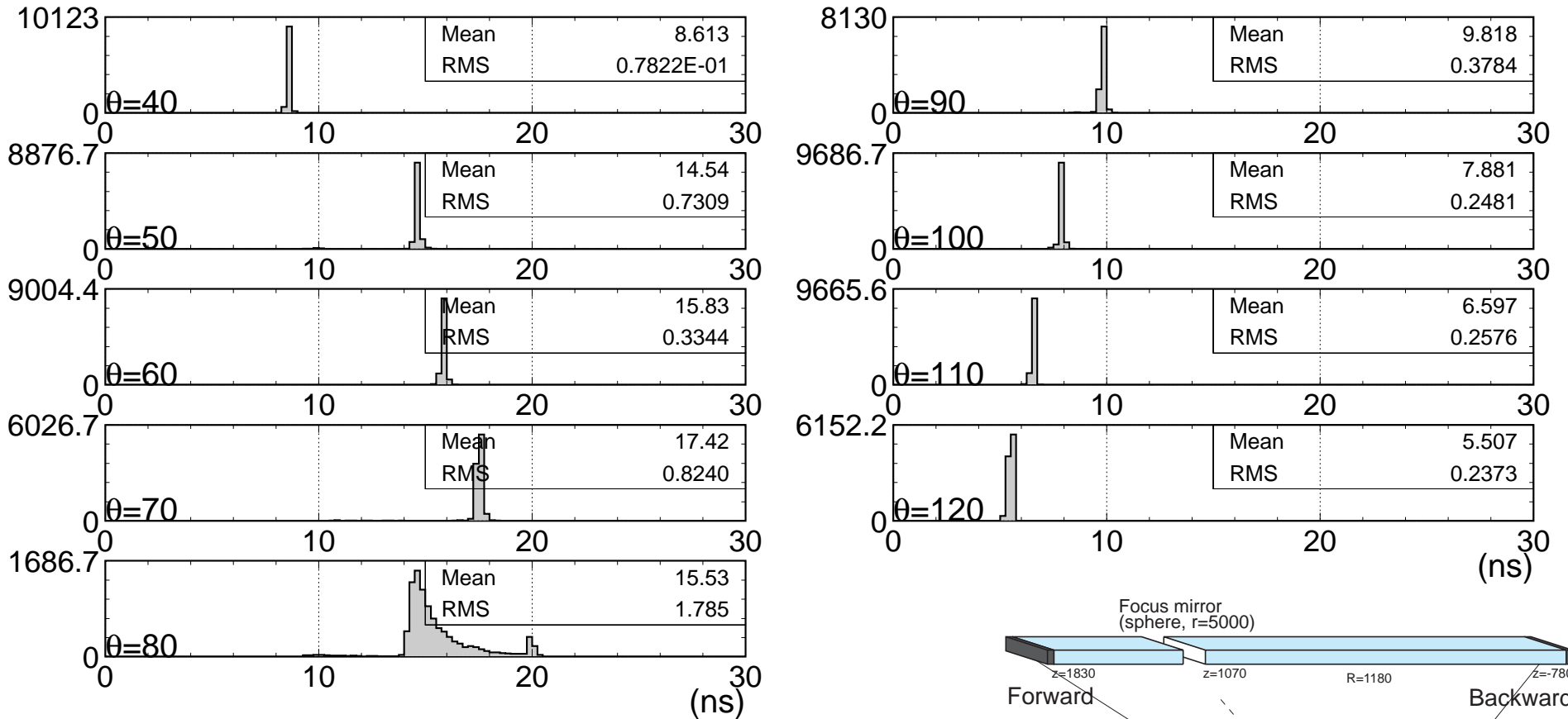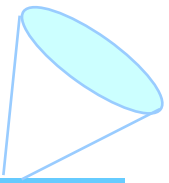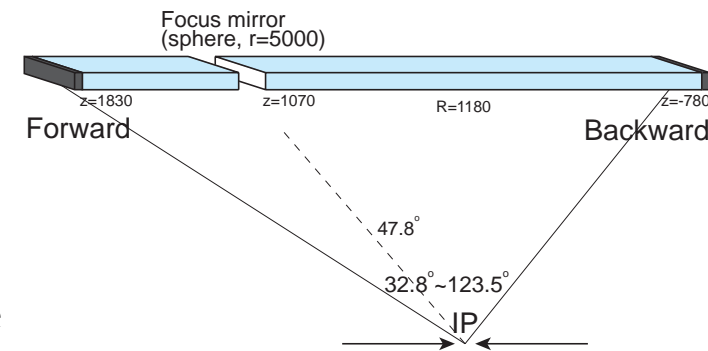   - ← depends on the noise rate

Trigger pattern

- Hit topology
  - Similar with current TOF

Timing of first arrival photon
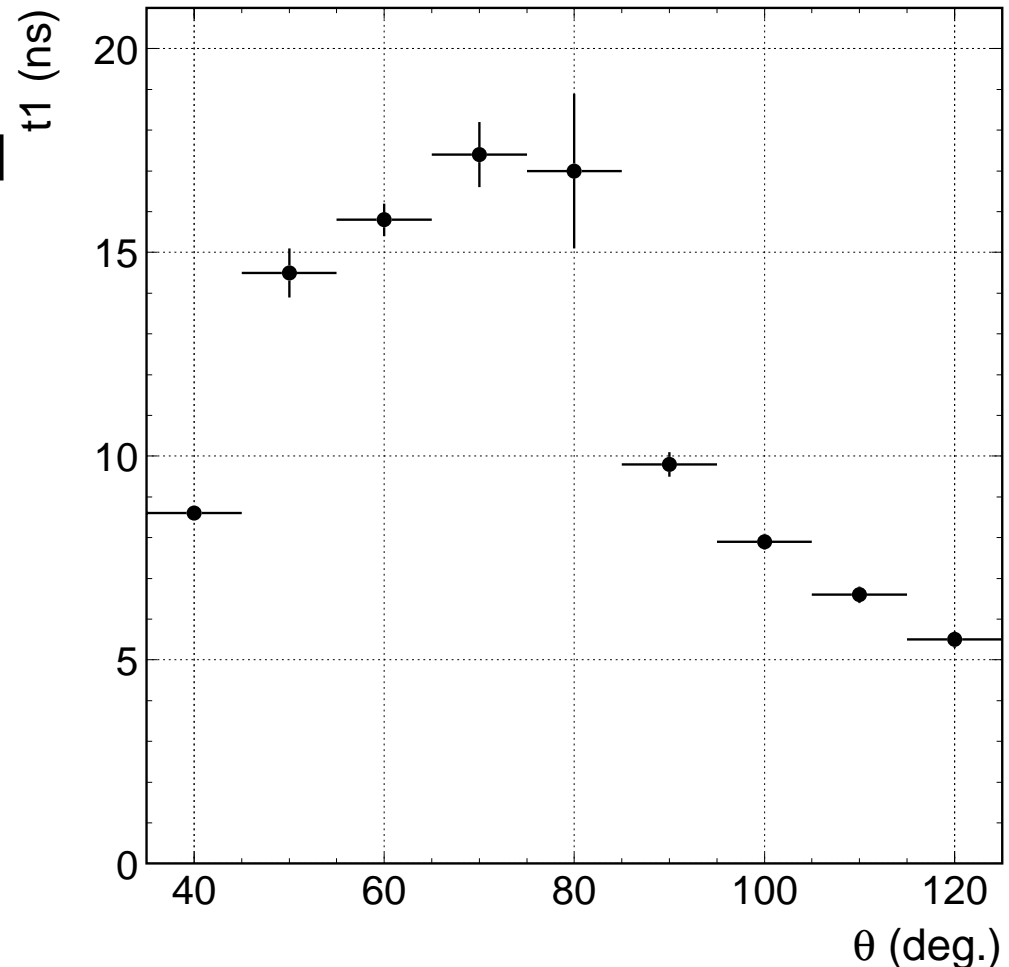

- **Large theta dependence**
  - No large momentum dependence
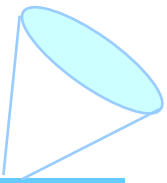
Timing of first arrival photon (2)

- Theta dep.: ~10ns

- For 1ns resolution, need tracking information with $\Delta Z \sim 10$cm

- Large fluctuation at $\theta \sim 80$deg.
  - → Need ring image reconstruction
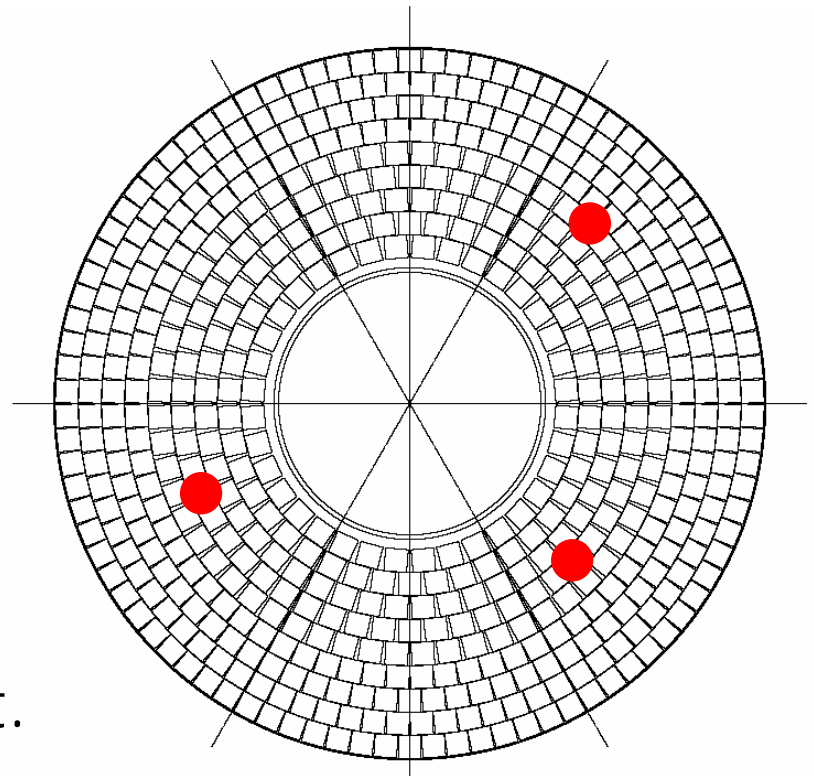
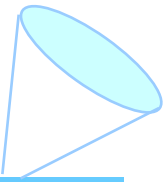

t1: Mean and RMS

Endcap detector

- ## Photo detector array on forward endcap

    - Detect cherenkov photons from aerogel

      (and window for HAPD, PMT, etc.)

    - Trigger hit per P.D.

- ## Similar trigger-pattern

    - Hit pattern

    - Timing information

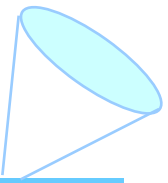   - Not seriously considered yet.

Trigger simulator

- Fix detector configuration first.

- Based on the current Geant4 output
  - TOP counter configuration
  - Hit timing from each PMT channel
  - Make logic mentioned before

Summary

- PID detectors can provide a trigger similar with TOF counter.
    - Counting logic to issue the trigger-hits
    - Hit pattern in ϕ
    - Trigger timing with ~10ns resolution
        - For more precise timing, need tracking information to correct the incident position dependence.

    - Endcap PID can also provide trigger.

- Need manpower for the trigger work!